CALIFORNIA ENERGY COMMISSION

New Solar Homes Partnership
Draft Guidebook

Update on

Eligible System Specifications
Field Verification
Expected Performance-Based Incentive Calculation

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CEC PV Calculator

- Based on "Five Parameter Model"
  - Algorithms developed by Dr. William Beckman, University of Wisconsin-Madison Solar Energy Lab (originator of F-Chart)
  - Public Domain Model Published in *Solar Energy*,

    80 (2006) 78-88 - www.sciencedirect.com
  - Uses readily available performance tests as inputs
  - Hourly performance calculation that enables TDV
  - Uses Commission weather data and climate zones
  - Uses Certified Module and Inverter data from CEC database
- Dr. Beckman implemented algorithms for CEC PV
- Commission would approve other software tools that properly implement the model and datasets

California Flexible Installation PV Calculator Interface

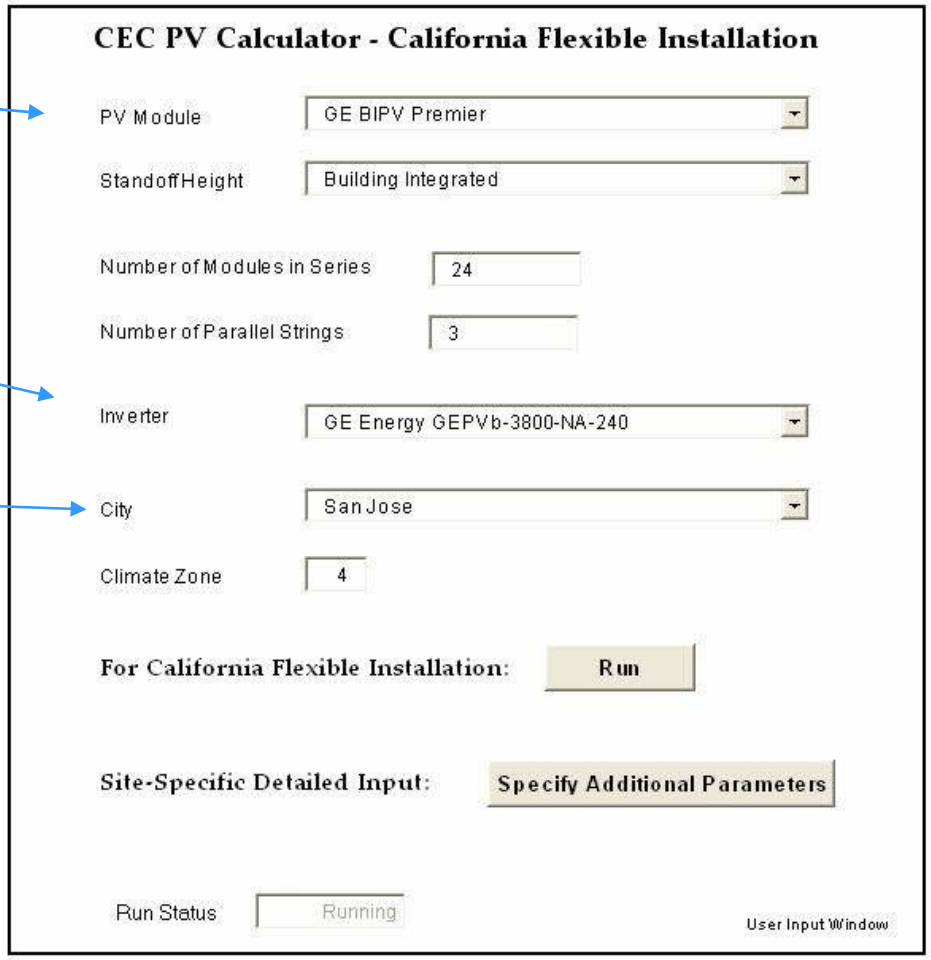
Choose from list of CEC certified PV modules (tested input values)

Choose from list of CEC certified inverters (tested input values)

Choose a city from Standards list (uses CZ weather file)

Select *RUN* for California Flexible Installation

Select *Specify Additional Parameters* to evaluate site-specific details



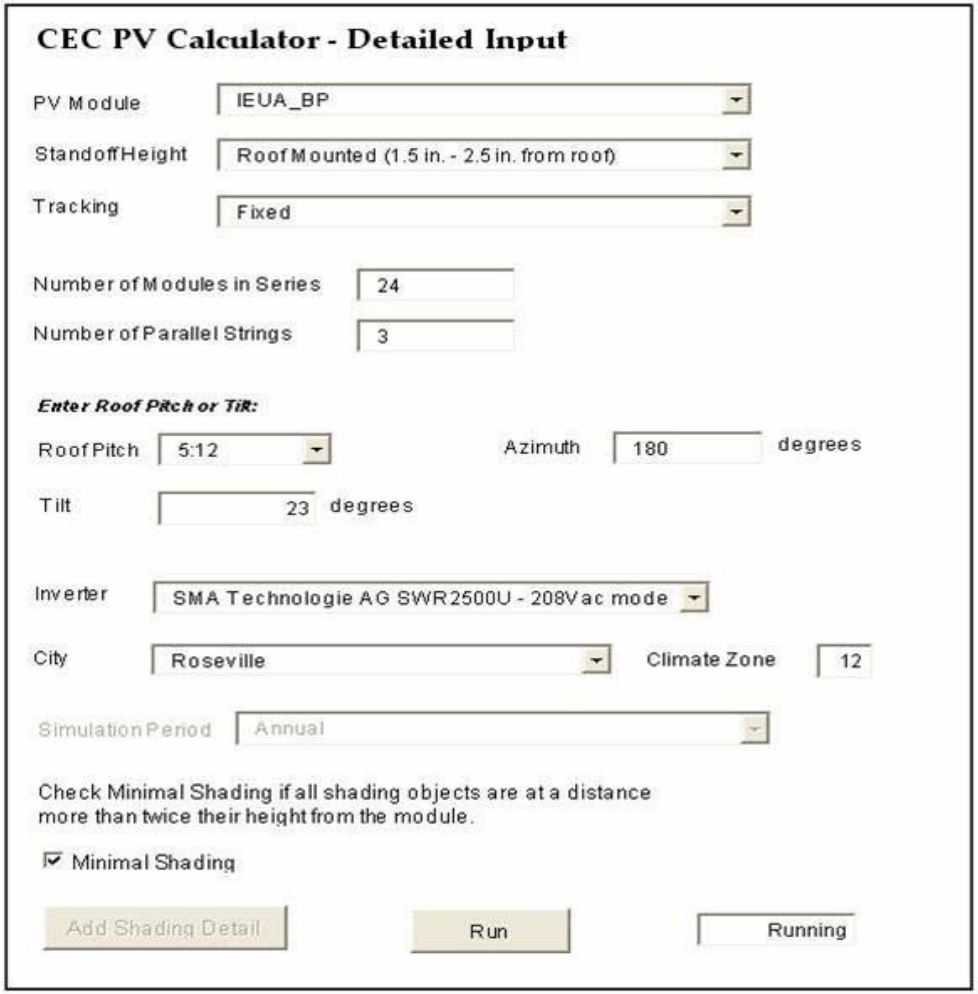
Site-Specific Detailed Input
PV Calculator Interface

Choose from list of CEC certified PV modules (tested input values)

Choose Stand-off Height for Rack-Mounted Systems

Enter roof pitch or tilt and module azimuth

Select Minimal Shading if all obstructions are at a distance of at least twice their height above the module



PV Calculator Results Window

Program calculates annual electricity production and TDV output

CEC Incentive is calculated based on comparison to the reference system

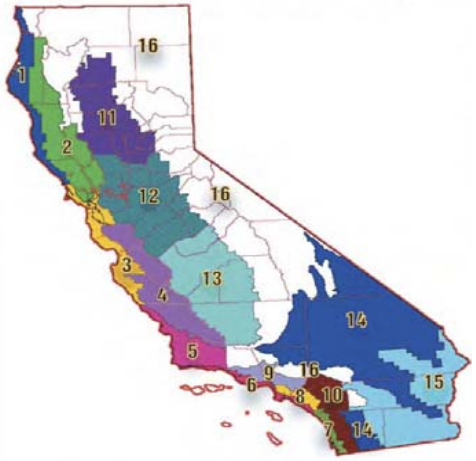
CEC PV Calculator - Results

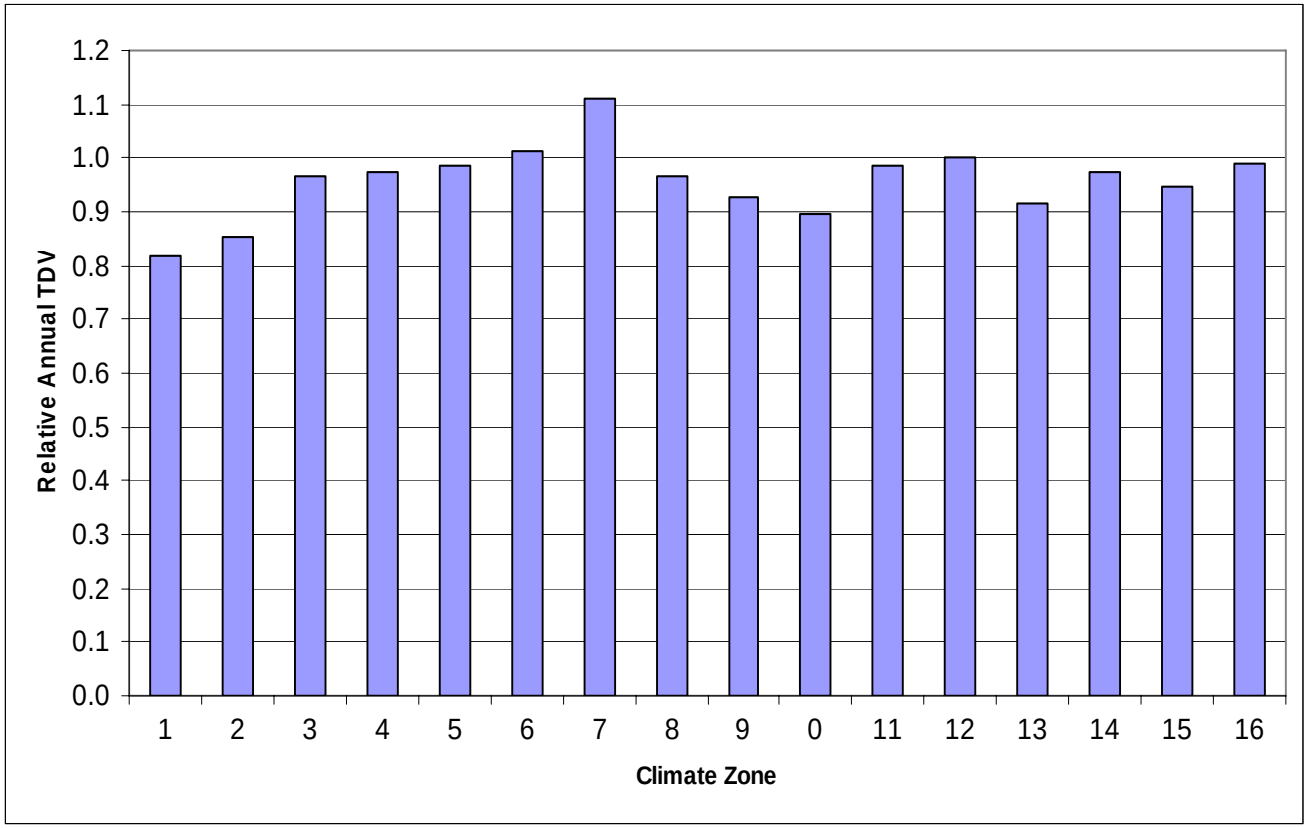
	kWh Production	TDV Production
January	95.6	1151.6
Febuary	118.6	1299.5
March	205.7	2274.9
April	268	3540.5
May	309.5	4614.9
June	332.9	5946.4
July	340.1	11014.1
August	303	9429
September	239.2	4795.1
October	170.5	2478.4
November	118.9	1550.1
December	84.9	1187.6
Annual	2587	41082

CEC Incentive

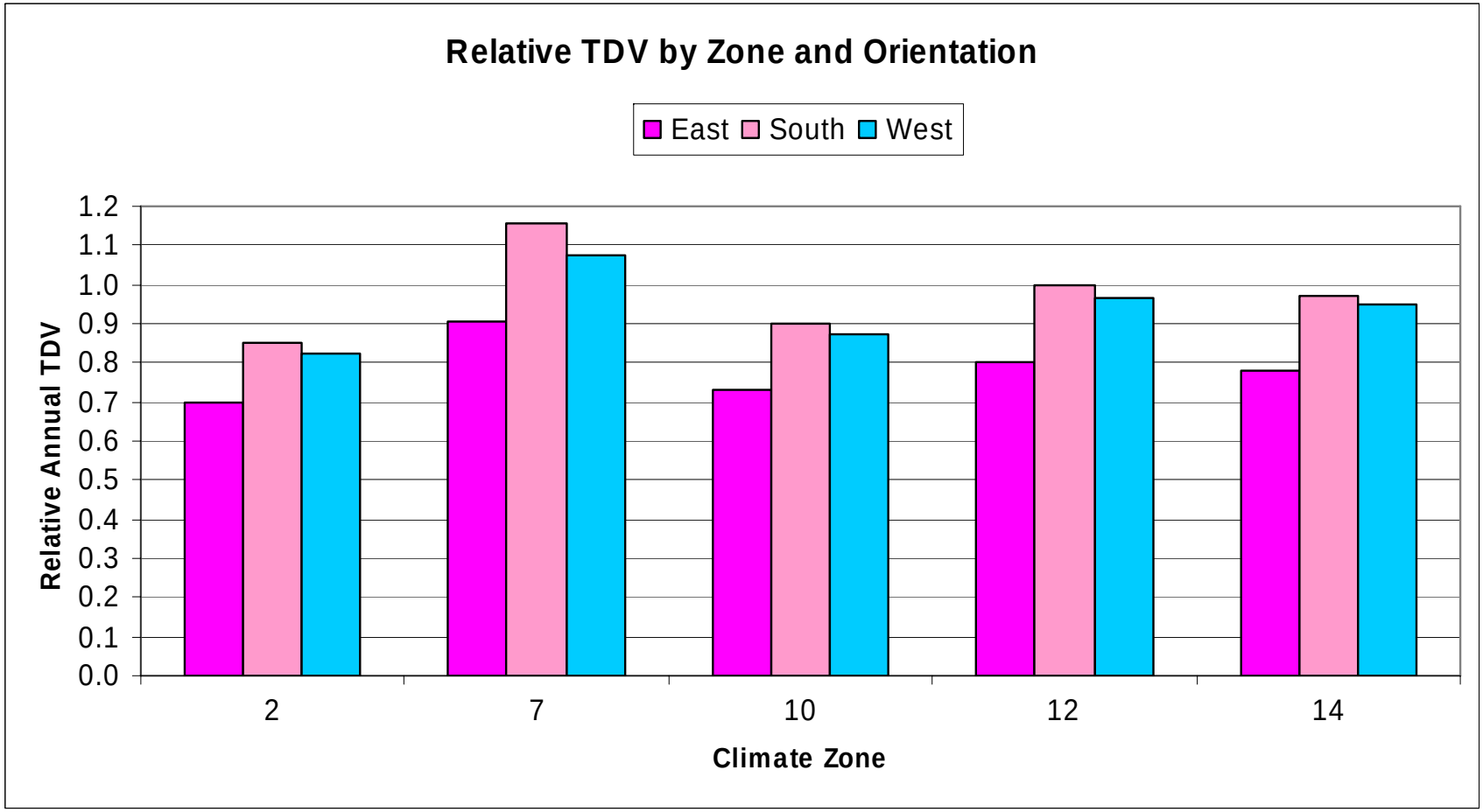
$TBD

PV Calculator Results By Climate Zone





PV Calculator Results By Orientation



Module Certification

- Manufacturer Certification of Performance Test Data
  - IEC Standard 61215 – Crystalline Silicon Modules
  - IEC Standard 61646 – Thin-Film Modules
  - Use American Association for Laboratory Accreditation (A2LA) Accredited Laboratories for Testing
  - Use CEC Test Configuration for Cell Temperature Testing for BIPV
- Performance of Production Modules
  - Manufacturers insure production modules perform as well as performance certified to the Commission taking into account preconditioning (61215) or light soaking (61646)

Appendix 3

Field Verification

- Visual Inspection
  - Verify that installed equipment (modules and inverter) are the same as specified
  - Verify that the system meets the California Flexible Installation Criteria OR
  - Verify that site-specific installation details are the same as specified in the calculations
- Shading Evaluation
  - Check for "minimal shading" criterion
  - Check for shading obstructions specified in the calculations
  - Check for trees that will shade modules at maturity
- Performance Verification
  - Measure solar irradiation and ambient temperature
  - Look up the expected output for the measured conditions on the table generated by the CEC PV software
  - Verify AC output displayed on the inverter is as expected
- Installer Checks 100%; HERS Rater Uses Sampling

Appendix 4

Energy Efficiency

- Tier I – Minimum Condition of Participation
  - 15% Savings Beyond T-24 Total Energy Budget
  - Current Utility New Construction Programs
- Tier II – Immediate Positive Cash Flow
  - 35% Savings Beyond T-24 Total Energy Budget
  - 40% Savings Beyond T-24 Space Cooling Budget
  - Commission Preferred Level
  - Moves Towards Zero Energy New Homes
  - Achieved by Current Building America Homes in California
  - Commission Seeks CPUC/Utility Support for New Construction Program Incentives for Tier II
- Both Tiers: High Efficacy Lighting and Energy Star Appliances

Reference PV system and parameters

Parameters	Reference
Location	Sacramento (latitude, longitude, weather file and TDV)
Azimuth	South (180 deg)
Tilt	5:12 pitch (22.5 deg)
Mounting	BIPV
PV Modules	Premier Gardens system as the reference
Number of modules	
String (series and parallel)	
Inverter	
Shading	None
Default losses	Dirt dust and mismatched wiring (0.88)